

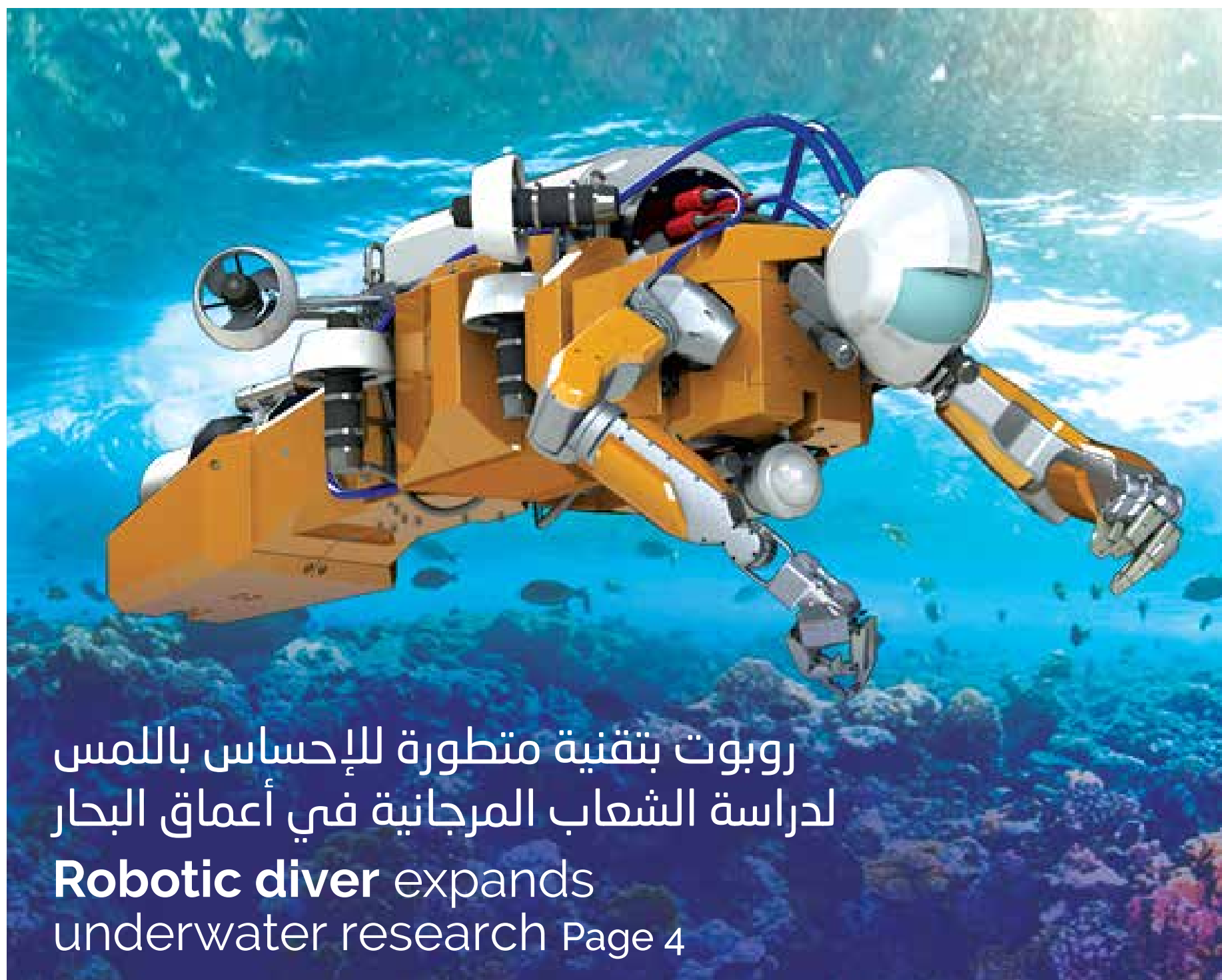
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جامعة الملك عبد الله للعلوم والتقنية
ثول، المملكة العربية السعودية

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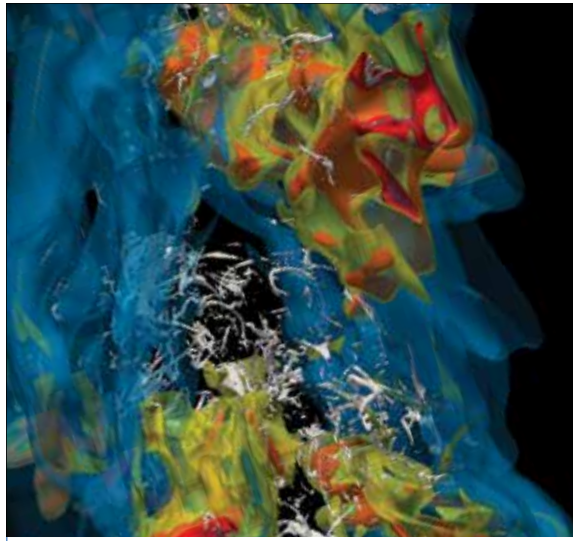
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ENRICHMENT
IN THE SPRING

In brief

The University Library is hosting a series of training workshops designed to help KAUST researchers and students **learn about the library's resources**. All classes are held in the University Library, Computer Lab, level 3, and are open to the entire KAUST community, unless otherwise noted. Sessions on resources such as the ACM digital library, the KAUST digital archive, ORCID and Scopus will be offered through April 31. Find more information and register at libguides.kaust.edu.sa/libtraining.

The KAUST Laboratory of Nano Oxides for Sustainable Energy hosted a conference on **Functional Nanomaterials** from **March 15 to 17**. The conference brought together experts in the areas of design, synthesis and applied nanomaterials to promote discussion, generate innovative ideas and address some of the most pressing challenges to the field. A wide array of topics was explored, with a special focus on how nanomaterials will transform the landscape of future technologies.

Delivery of KAUST's new Cray XC40 **supercomputer Shaheen II** will take place between Sunday, March 15 and Saturday, March 21. The delivery will involve a convoy of trucks to transport Shaheen II from the main campus entrance to Al-Khawarizimi (building 1). Access will be restricted around this area during these dates.

The Clean Combustion Research Center will host a **High-Pressure and High-Reynolds**

Workshop from **March 24 to 26**. The three-day workshop will provide a forum for the presentation of notable results and the exchange of ideas in the field of turbulent combustion at elevated pressure and in flow configurations characterized by intense turbulence. Topics in experimental methods, diagnostic development and numerical simulation (direct numerical and large-eddy simulation) will be explored.

KAUST community members are invited to submit their original works of visual art for the **2015 Artists of KAUST exhibition**. The exhibition will open with a reception on April 22 and will be on display in the University Library until May 5. Examples of accepted works of art include paintings, photography, textiles, jewelry, sculpture, calligraphy and ceramics. Submissions will be accepted from March 30 – April 1. For details on exhibit guidelines and how to submit your art, visit artsoffice.kaust.edu.sa or contact artistsofkaust@kaust.edu.sa.

The **Spring Community Town Hall** will take place on **March 31 from 7:00 – 8:30 p.m.** in the Auditorium. The entire KAUST community is invited to the conversation about community life. Come hear the latest updates from the teams who help enhance life in our community.

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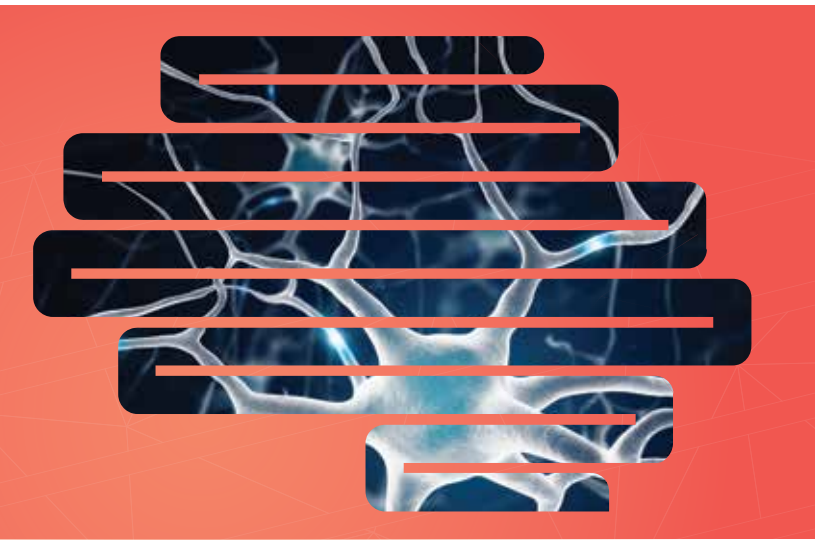
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Enrichment in the Spring

The first annual Enrichment in the Spring, an exciting program open to the whole KAUST community, will take place from March 20-28, 2015.

Inspired by Brain Awareness Week, Enrichment in the Spring's main theme is the brain and human mind. The week-long program will explore memory and emotion and all the functions of our complex brains with lectures on neuroscience, language and 3D visualizations of the brain. Enrichment in the Spring will also feature community events for every age and interest, including games to entertain your brain and art exhibitions.

Lectures will feature topics ranging from whale sharks to writing Korean Hangul characters. A keynote lecture on neuroscience and neurological pathologies will be delivered by 2014 recipient of the Lasker-DeBakey Clinical Medical Research Award and 2015 winner of the Breakthrough Prize in Life Sciences Alim-Louis Benabid.

Also planned are several multimedia and musical performances, including a photo exhibition, a film festival and a special session on music, emotion and the brain, featuring guest composer/musician Mike McGinnis, KAUST Dean of the Biological and Environmental Science and Engineering Division Pierre Magistretti and KAUST community musicians. Other musical performances will feature guest soprano Jennifer Cho and tenor John Tiranno.

To view the complete program or to register, visit <http://sep.kaust.edu.sa>.

Follow SEP and the Enrichment team on Twitter @EnrichAtKaust and on Facebook: Enrichment at KAUST. Don't forget to follow and use the hashtags #SEP2015 #BrainWeek. ●

Cover: KAUST and Stanford University, together with Meka Robotics, collaborated to design and build a radical new underwater robotic platform to serve as a robotic avatar diver.

1,2,3. KAUST Ph.D. students Joanna Nassar (1), Stephanie Saade (2) and Mohamed Zidan (3) will attend the 65th Lindau Nobel Laureate Meeting.

Accolades



Ph.D. students invited to 65th Lindau Nobel Laureate Meeting

Joanna Nassar (Electrical Engineering), Stephanie Saade (Bioscience) and Mohamed Zidan (Electrical Engineering), three KAUST doctoral students, have been invited to the 65th Lindau Nobel Laureate Meeting, which will be held on June 28 – July 3. A record number of 70 laureates and 672 young scientists from 88 countries will participate. It will be the fourth interdisciplinary meeting bringing together Nobel laureates and young scientists from the fields of physiology and medicine, physics and chemistry.

The selection of the young researcher attendees is made in cooperation with the meeting's academic partners. Participants are nominated by more than 100 institutions, and some are also nominated by specific Nobel laureates. Those showing a genuine interest in science and research and a strong commitment to their principal field of studies and to interdisciplinary work are invited to attend the event.●

Prof. Ghanem awarded Google Faculty Research Award



Assistant Professor of Electrical Engineering Bernard Ghanem was one of the recipients of the Google Faculty Research Award: Winter 2015. The biannual open call is for research proposals on computer science and related topics, including systems, structured data, robotics, mobile and machine perception, the area in which Ghanem won his award.

In the winter 2015 round, Google received 808 proposals covering 55 countries on six continents. After expert reviews and committee discussions, 122 projects were awarded funding. The funding covers tuition for a graduate student and provides both faculty and students the opportunity to work directly with Google researchers and engineers. ●

Robotic diver expands underwater research

By David Murphy



“The robot provides access to so many novel engineering solutions, which allows you to do things that were not possible before. Now we are truly able to touch and feel the bottom of the ocean.”

The research project is being conducted between KAUST's Computer, Electrical and Mathematical Science and Engineering (CMSE) Division, KAUST's Red Sea Research Center in the Biological and Environmental Science and Engineering (BESE) Division and the Artificial Intelligence lab team at Stanford University.

The KAUST team includes Professors Khaled Salama, Xabier Irigoyen and Christian R. Voolstra. Stanford's team is led by Professors Oussama Khatib and Mark R. Cutkosky.

Voolstra sat with us to provide additional insight into the venture.

What goes into creating a robot of this kind?

A lot goes into the software development side of artificial intelligence and into knowing how the robot will move and interact. Our Stanford colleagues are pioneers in the field of human-assisted robotics, and our robot is capable of autonomously moving in a given environment, keeping its balance and counteracting the currents underwater.

The controlling interface comes from the field of microsurgery. Your hands and movements become the little pinching device, and the robot instantly mimics your actions. You also have haptic technology, which is the sense of touch. Another advantage of intuitive control is that it is easy for a researcher to learn – the connection between what you're doing and the robot is direct and instantaneous.

How far along are you into the creation of a prototype?

The parts are being assembled by the Artificial Intelligence Lab at Stanford. The robot arms come from Meka Robotics in San Francisco.

When building a device like this, waterproofing becomes a problem because you can only go to a certain depth. This is the first robot where we built the entire parts oil-immersed, making the robot waterproof to a depth of 2,000 meters.

Because the robot is built in a virtual environment, you can work with it before it assembly. We also built an underwater world for the robot to explore. In the real world, we attached the arms and are in the process of putting it together. I think this summer will be a realistic date of having the robot in the water.

What percent of coral remains unexplored due to current technological limitations?

We only look at about 25 percent of reef biomass, but there is much more below that depth. This is especially true for the Red Sea, where the water is very clear so light can penetrate to deeper depths. With this technology you can rethink how you approach underwater research.

Do you see any other professions that can benefit from this type of technology?

The team envisions that in the near future, we will be able to utilize different robots with the same tele-operation framework for different tasks, such as in undersea pipeline inspection and repair, defusing mines, aircraft maintenance, exploring disaster areas and rescue operations.

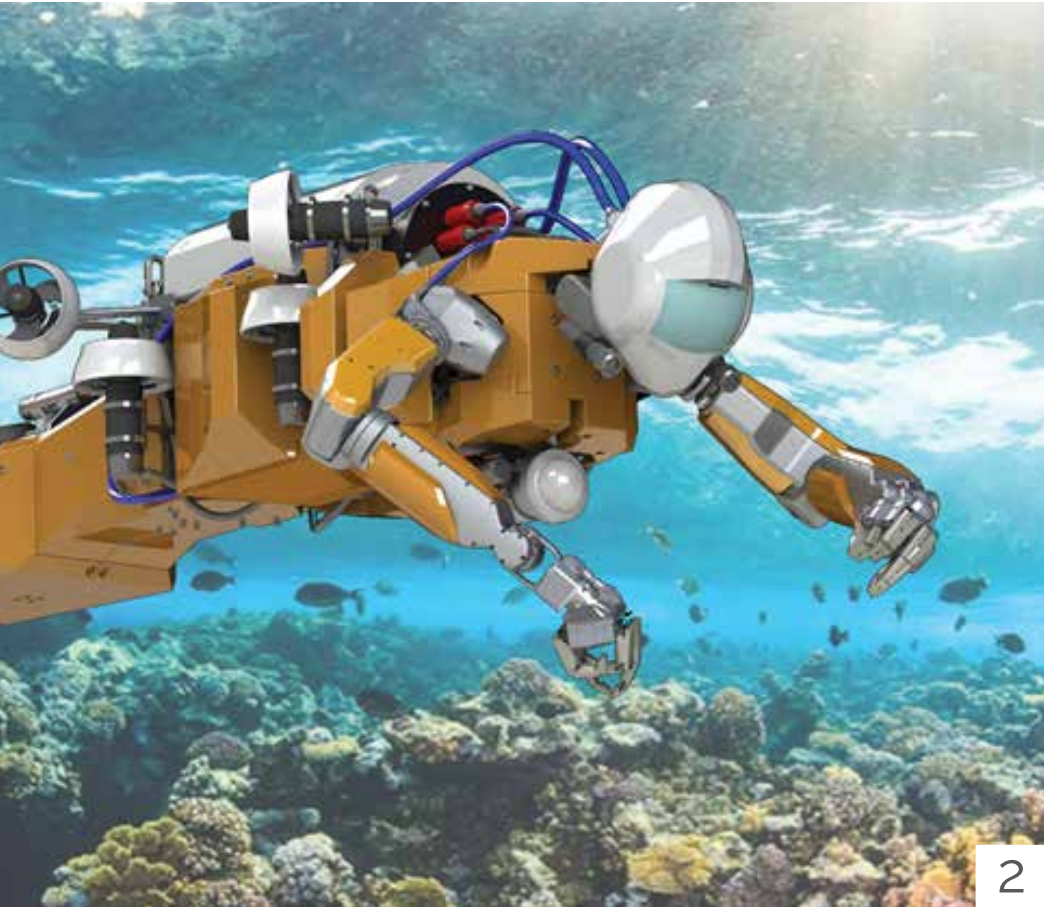
The robot provides access to so many novel engineering solutions that allow you to do things that were not possible before. Now we are truly able to touch and feel the bottom of the ocean. I think this form of robotics is one of the next frontiers in science.●

1. KAUST Assistant Professor of Marine Science Christian Voolstra.

2,3. KAUST and Stanford University, together with Meka Robotics, have been collaborating to design and build a radical new underwater robotic platform to serve as a robotic avatar diver.

Image 2 by Tane Sinclair (KAUST) and Gerald Brantner and Xiyang Yeh (Stanford University).

Image 3 by Gerald Brantner and Xiyang Yeh (Stanford University).



روبوت بتقنية متطورة للإحساس باللمس لدراسة الشعاب المرجانية في أعماق البحار

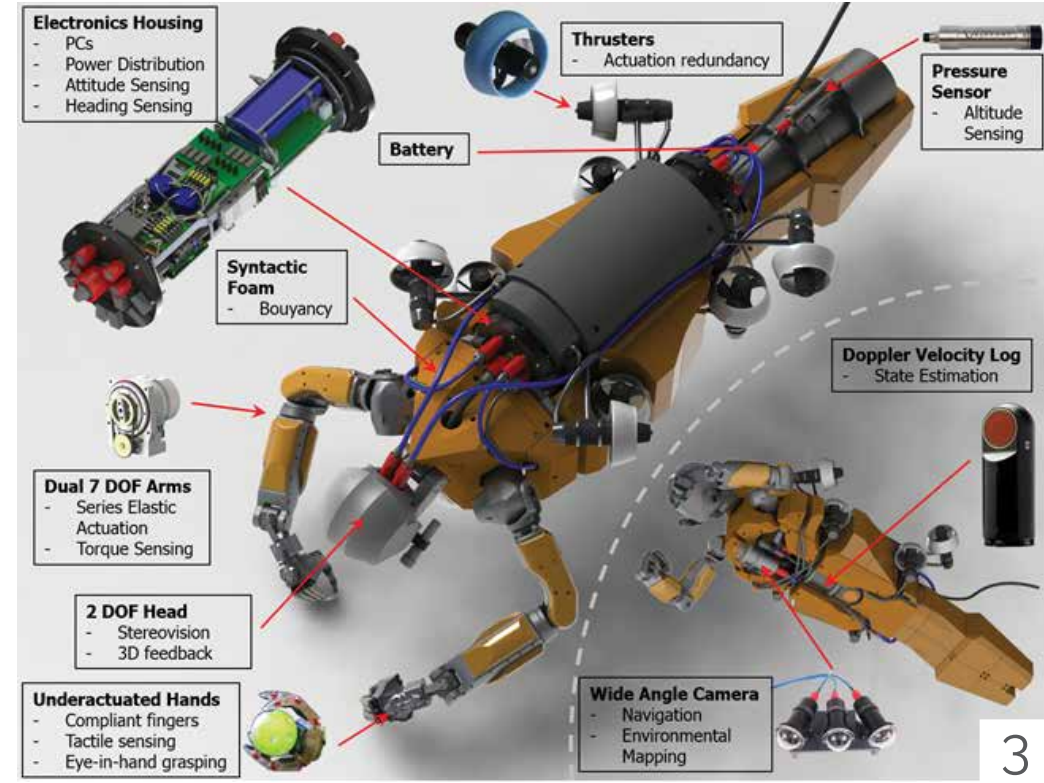
تعتبر الأبحاث تحت سطح البحر وخصوصاً استكشاف المياه العميقة ذات أهمية كبيرة لفهم الأنظمة البيئية المحيطة ودراسة مواردها والتغيرات التي تحدث نتيجة العوامل البيئية سواءً الطبيعية منها أم البشرية. وتواجه هذه الدراسات عقبات كبيرة مثل خطورة المنطقة أو صعوبة الوصول إليها، إضافة لتكلفتها الباهظة. كما أن محدودية قدرات الغواصين في الوصول لأعماق كبيرة تشكل تحدياً آخر في عملية استكشاف قيعان البحار والمحيطات. لهذا يعتمد علماء البحار على الغواصات البحرية، إلا أنها تفتقر لمهارة الإنسان الضرورية في الأبحاث العلمية مثل أداء المهام البسيطة كجمع العينات وعمل التجارب الميدانية والقدرة على الفوص في الأماكن الضيقة التي يصعب الوصول لها، إضافة إلى تصميمها الغير ملائم للعمل في البحار ذات الطبيعة الهائجة.

ويجري هذا المشروع البحثي في جامعة الملك عبدالله بالتعاون بين قسم العلوم والهندسة الحاسوبية والكهربائية والحسابية (CMSE) ومركز أبحاث البحر الأحمر في قسم العلوم والهندسة البيولوجية والبيئية (BESE)، وفريق مختبر الذكاء الاصطناعي في جامعة ستانفورد. ويضم فريق جامعة الملك عبدالله كل من البروفيسور خالد سلامة والبروفيسور زاير إريغوين، والبروفيسور كريستيان فولسترا، ويقود فريق ستانفورد البروفيسور أسامة خطيب ومارك كوتكوسكي، وهذا المشروع مدرج تحت منحة AEA3 للأبحاث التعاونية.

ويقول البروفيسور فولسترا، أستاذ مساعد في علوم البحار في مركز أبحاث البحر الأحمر، إن بداية المشروع كانت عندما تواصل البروفيسور خالد سلامة، أستاذ في قسم الهندسة الكهربائية في جامعة الملك عبدالله، مع بعض أصدقائه الباحثين في جامعة ستانفورد من أجل المساعدة لتصميم واجهة نظام (روبوتية) جديدة. ويتطلب هذا المجال تطوير برمجيات باللغة التعقيد ودراسة كيف تتحرك الروبوتات وكيفية تفاعلها مع المحيط الخارجي مع الحفاظ على توازنها دون التأثير بالتيارات تحت الماء بحيث يتيح المجال للباحث في التركيز على بحث. كما يضم تقنية متطورة تحاكي اللمس يستطيع الباحث من خلالها الشعور بلمس الأجسام التي يمسكها الروبوت في الوقت الفعلي دون الحاجة للفوص.

ولا زال العمل مستمر في الوقت الحالي لتجميع الروبوت في مختبر الذكاء الاصطناعي في جامعة ستانفورد. فيما تم الانتهاء من تصميم ذراع الروبوت في مختبرات ميكاروبوتكس في سان فرانسيسكو وتطوير جميع القطع لتعمل بتقنية التفطيس بالزيت بحيث يصبح الروبوت مقاوم للماء والضغط في الأعماق.

وأوضح البروفيسور كريستيان فولسترا أن العلماء يستخدمون حالياً غواصات صغيرة تسمى (ROV) مجهزة بذراعين آليين بمجال حركة محدود وغير عملية لدراسة البيئة المرجانية. ولكن تصميم روبوتهم مقارب



لشكل الفواص الحقيقي ويمكنه استخدام نفس الآلات التي يستخدمها الغواصون. ومن المحتمل أن تكون النسخة الأولية للروبوت موصولة بقارب خاص. ولكن يجري التخطيط لتطوير ذلك في وقت لاحق بحيث يتم بناء محطة تحت الماء تكون بمثابة قاعدة للروبوت يستطيع من خلالها شحن بطاريته والعمل بصورة ذاتية ومستقلة.

وأشار البروفيسور فولسترا إلى أن هذه التقنية ستلعب دوراً فاعلاً في المستقبل القريب خصوصاً في تنفيذ المهام المختلفة تحت الماء كالتفتيش على خط الأنابيب البحرية وإصلاحها، والكشف عن الألغام البحرية وإبطالها، وصيانة الطائرات والسفن والغواصات، واستكشاف المناطق المنكوبة، وكذلك في عمليات الإنقاذ تحت الماء. وهذا المشروع الكبير يتطلب حرية علمية ومساحة واسعة وموارد كبيرة لا تتوفر إلا في منشأة علمية متطورة مثل جامعة الملك عبدالله والتي أيضاً تتيح فرصة التعاون البحثي في مختلف المجالات للخروج بحلول لأي مشكلة تواجه المشروع وهذا ما يجعلها مكاناً مميزاً وملائماً لإجراء الأبحاث التقنية الكبيرة والمعقدة".



SRSI shapes future scientists and leaders of Saudi Arabia

By Caitlin Clark

1

The Saudi Research Science Institute (SRSI) is preparing for its fifth annual summer program, in which top Saudi high school students will conduct university-level research at KAUST under the mentorship of University faculty.

SRSI is a research program that introduces students to the transformative potential of science, technology, engineering and math (the STEM fields) and inspires them to pursue further education and careers in these fields. SRSI is a gateway to future studies at KAUST and aims to develop the next generation of scientists, researchers and leaders for Saudi Arabia.

Immersing students in research

KAUST faculty members play an important role as mentors for SRSI students, developing research projects for them and working closely with them. The projects immerse students in research, allowing them to learn first-hand about a research career.

Lamees Alshaikh, a high school senior at Dhahran Ahliyya Schools, participated in the 2014 program.

"I first learned of the SRSI program in 2011, and it became a dream of mine to attend it. I couldn't wait until the summer of 2014 when my dream became a reality," she said.

Alshaikh worked under KAUST Associate Professor of Biosciences Salim Al-Babili, studying the biosynthesis of hormones in *Chlamydomonas reinhardtii*, a type of algae.

"The experiment for my project took some time to complete, and I had to stay in the lab after assigned work hours," Alshaikh explained. But this was not a problem for her, as she enjoyed every bit of it. "With my supportive research team, spending my time researching was a pleasure," she said.

Al-Babili was amazed at the amount of knowledge Alshaikh acquired in a few weeks.

"The program encourages student curiosity in higher-level scientific research," he said. "It is an excellent way to recruit the best students in the Kingdom to come back to KAUST."

An opportunity of a lifetime

Alshaikh's time at KAUST and in SRSI were a once-in-a-lifetime experience. "I enjoyed the program more than anything I have done before. SRSI was an extraordinary and transformational educational experience," she said.

Farzan Ghodsi, also a graduate of the 2014 program, described how he was matched to conduct research in his favorite branch of science, electrical engineering.

"I'm a senior at The KAUST School, and I was contacted by

"SRSI students have bright minds, immense enthusiasm and lots of imagination. All these qualities lead to new and innovative ideas that are the keys to exploring and solving problems in the scientific world."

KAUST's Saudi Initiatives organization to apply for SRSI. I didn't hesitate, as I had heard how incredible it was," he said.

Ghodsi worked under Professor of Electrical Engineering Boon Ooi to study semiconductor quantum dot lasers.

"The goal of the project was to fabricate and characterize novel semiconductor quantum dot lasers. These lasers have the potential to replace power-hungry electronic circuits for interconnects and clocking applications in data centers, server farms and supercomputers," Ghodsi explained.

The 2014 program was Ooi's fourth time as an SRSI mentor. "I enjoy working alongside the high-energy and motivated students, and I learn a lot from them," he said.

"SRSI allowed me to explore the field of electrical engineering and solidified my decision to major in electrical engineering for my undergraduate degree," Ghodsi said. "The program also taught me about the dedication required to conduct research in science and engineering."

Mentoring the future scientists of tomorrow

Kazuhiro Takanabe, Assistant Professor of Chemical Science, mentored high school student Mohammed Al-Shebbel during the 2014 program.

"SRSI students have bright minds, immense enthusiasm and lots of imagination. All these qualities lead to new and innovative ideas that are the keys to exploring and solving problems in the scientific world," Takanabe said.

Takanabe also noted the value of the program for Saudi Arabia. "For the students, going from high school to working in a world-class research university might be a stepping stone to becoming a leader for the country," he said. "The program nourishes the students, and through this one can expect a better future for the Kingdom and the world."

SRSI is currently recruiting faculty members to serve as mentors for the 2015 program. If you are interested in mentoring an SRSI scholar, please contact srsi@kaust.edu.sa. ●



المستخدمة في روابط الشبكات وتطبيقات تسجيل الوقت في مراكز البيانات، ووحدات الخوادم الشبكية وأجهزة الكمبيوتر العملاقة. وقد شارك بحثي في تطوير تقنية جديدة لتوصيف ليزر أشباه الموصلات¹.

يصف البروفيسور أوي تجربته في الإشراف في هذا البرنامج بأنها ممتعة مع الطلبة المتحمسين ذوي الطاقات العالية، مشيداً بالخبرات التي يكتسبها الطلبة والثقة العالية بهرضهم لاعمالهم بشكل مستقل أمام عدد كبير من الحضور.

وأعرب فرزان عن استمتاعه بالبرنامج موضحاً : "لقد سمح البرنامج لي استكشاف مجال الهندسة الكهربائية، ودعم قرارتي في التخصص في هذا المجال للحصول على البكالوريوس في الهندسة الكهربائية. وتعلمت من البرنامج أيضاً الاخلاص والتفاني اللازم لإجراء الأبحاث في مجال العلوم والهندسة، ومنحني العديد من المهارات الأخرى التي سوف تستمر لمدى الحياة".

الإشراف علي علماء المستقبل

قام بروفيسور كازوهيرو تاكانابي الأستاذ المساعد للعلوم الكيميائية بالجامعة بالإشراف على محمد الشابر الطالب بالمدرسة الثانوية خلال برنامج المعهد السعودي للعلوم البحثية عام 2014م. وقال البروفيسور تاكانابي: "يتمتع طلاب البرنامج بالذكاء والحماس الهائل والخيال الجامح. وهذه الخصال ضرورية لإنتاج الأفكار الجديدة والمبتكرة التي تعد أسس استكشاف في مجال العلوم. وهذا يزيد من حماسي للبرنامج".

وأشار البروفيسور تاكانابي أيضاً الي قيمة وأهمية البرنامج للمملكة العربية السعودية قائلاً: " قد يمثل انتقال الطلبة من المدارس الثانوية إلى العمل في مثل هذا الصرح البحثي الدولي المتطور بما يشمله من مرافق ومختبرات حديثة نقطة انطلاق لهم ليصبحوا قادة الفكر ورواد العلوم من أجل مستقبلاً أفضل للمملكة وللعالم".

ويقوم برنامج المعهد السعودي للعلوم البحثية حالياً باختيار وتكليف أعضاء هيئة التدريس بالجامعة للعمل كموجهين ومشرفين للبرنامج لعام 2015م. فإذا كنت مهتماً بالإشراف على أحد الباحثين بالبرنامج، يرجى التواصل على البريد الإلكتروني srsi@kaust.edu.sa.

المعهد السعودي للعلوم البحثية (SRSI) يسهم في تنمية علماء وقادة المستقبل في المملكة العربية السعودية

يستعد المعهد السعودي للعلوم البحثية (SRSI) لإطلاق برنامجه الصيفي السنوي الخامس، والذي يعد الأول من نوعه على مستوى المملكة، ويتيح للمتفوقين من طلبة المرحلة الثانوية في المملكة العربية السعودية الفرصة لإجراء الأبحاث العلمية على المستوى الجامعي في جامعة الملك عبدالله للعلوم والتقنية تحت إشراف أعضاء هيئة التدريس بها.

ويهدف البرنامج إلى تعريف الطلبة بأهمية العلوم والتقنية والهندسة والرياضيات، ويشجعهم على التفكير والدراسة والعمل في هذه المجالات، بالإضافة إلى الجمع بين الدراسة النظرية والبحثي. كما يعد تمهيداً في المستقبل للدراسة بجامعة الملك عبدالله بهدف تطوير الجيل المقبل من العلماء والباحثين وقادة الفكر في المملكة.

تشجيع الطلبة على العمل البحثي

يقوم أعضاء هيئة التدريس بجامعة الملك عبدالله بدور حيوي في التوجيه والإشراف على طلبة برنامج المعهد السعودي للعلوم البحثية من خلال تطوير المشاريع البحثية المستقلة لهم والإشراف عليهم طوال مدة البرنامج المكثف الذي يستغرق ستة أسابيع. ويدعم البرنامج الطلبة ويشجعهم على العمل البحثي ويمنحهم فرصة العمل مع طلبة الدراسات العليا وزملاء ما بعد الدكتوراه لاكتساب الخبرات المباشرة في إجراء الأبحاث.

الطالبة لميس الشيخ الطالبة بالمرحلة الثانوية من مدرسة الظهران الأهلية روت تجربتها في هذا البرنامج عام 2014م. وقالت " لقد سمعت للمرة الأولى عن برنامج المعهد السعودي للعلوم البحثية من صديقاتي في الاولمبياد الوطني للإبداع العلمي السعودي في عام 2011م، حيث كنت أعمل على مشروع مستقل، وكنت أبحث عن مختبر مؤهل يمكنني من خلاله إجراء تجاربي. وفور معرفتي بالبرنامج اصبحت المشاركة فيه حلمًا، وتحقق لي ذلك بفضل الله في صيف عام 2014م".

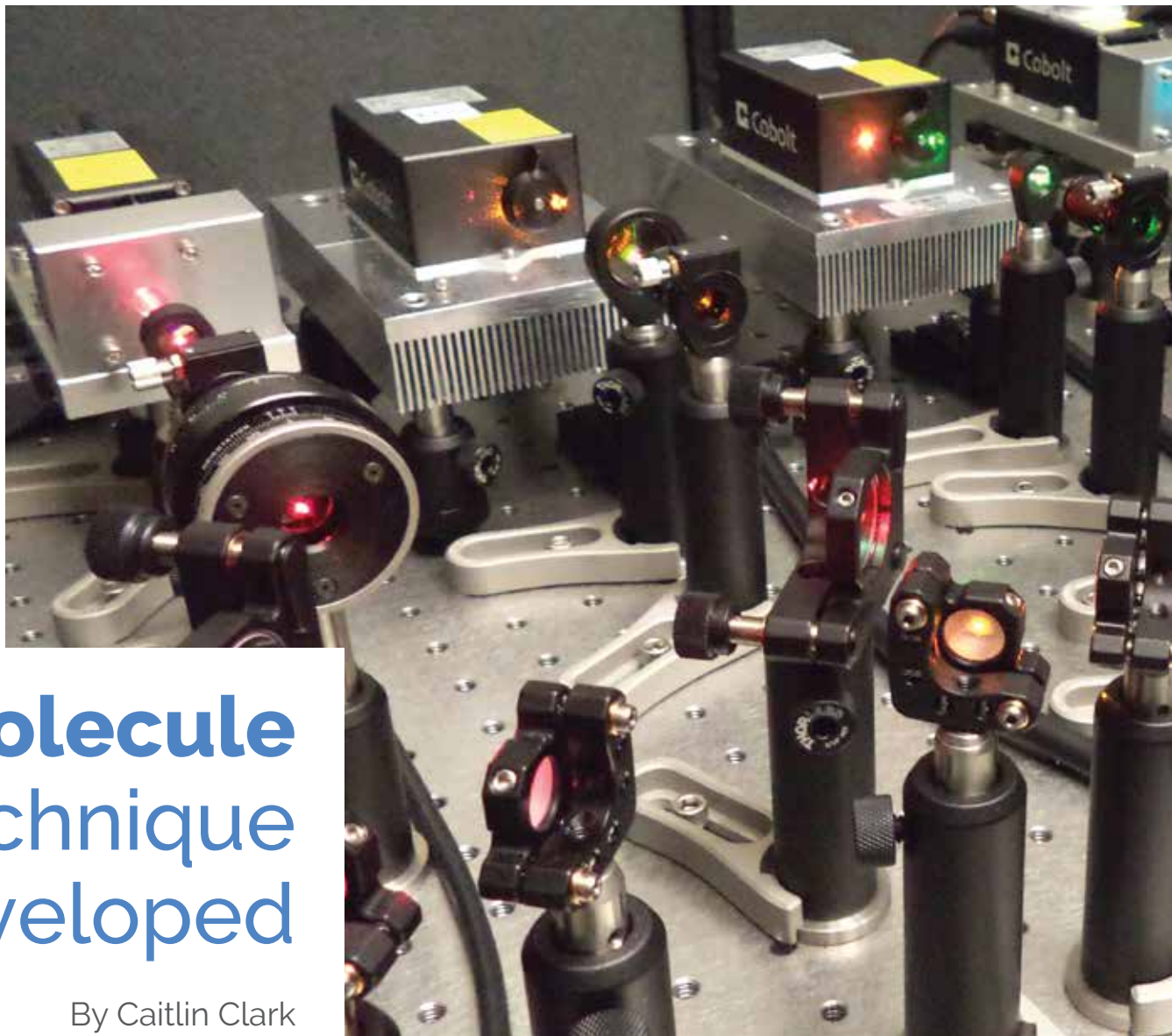
وقامت لميس بعمل دراسة بقسم العلوم البيولوجية عن التركيب الحيوي لهرمونات نوع من الطحالب يسمى كلاميدوموناس رينهاردتي حيث عبر البروفيسور المشرف على دراستها الدكتور سليم البابلي عن دهشته من الخبرة المعرفية التي اكتسبتها الطالبة لميس في غضون مدة قليلة.

فرصة فريدة وخبرة استثنائية

أما الطالب فرزان قدسي، أحد خريجي البرنامج عام 2014م قد رغب في إجراء الأبحاث في المجال العلمي المفضل له وهو الهندسة الكهربائية، وعمل فرزان تحت إشراف البروفيسور بون اوي أستاذ الهندسة الكهربائية بالجامعة لدراسة ليزر أشباه الموصلات الكمي. وقال: "كان الهدف من المشروع هو تصميم ليزر أشباه الموصلات الكمي. وهذا النوع من الليزر يستخدم كبديل للدوائر الكهربائية العالية

1. Under the mentorship of KAUST Associate Professor of Biosciences Salim Al-Babili (L), Lamees Alshaikh (R) studied the biosynthesis of hormones in Chlamydomonas reinhardtii during the 2014 SRSI program. Photo courtesy of SRSI.

2, 3. Students Farzan Ghodsi (2) and Mohammed Al-Shebber (3) attended SRSI 2014. Photos courtesy of SRSI.



New single-molecule imaging technique developed

By Caitlin Clark

For over 30 years, single-molecule localization and tracking (SMLT) has been one of the best ways to characterize the motion of individual molecules. Scientists use this method to examine cells at the subcellular level and to better understand the properties of polymers used in materials processing and fabrication, for example.

"The characterization of these processes is essential in both the fundamental sciences and in industrial applications," said KAUST Associate Professor of Bioscience Satoshi Habuchi.

“It expands the capability of molecule imaging techniques to a wider spectrum of research areas.”

In a Nature Communications paper Habuchi coauthored with postdoctoral fellow Dr. Maged Serag and doctoral student Maram Abadi from KAUST's Biological and Environmental Science and Engineering Division, the researchers outline how they developed a new single-molecule imaging method.

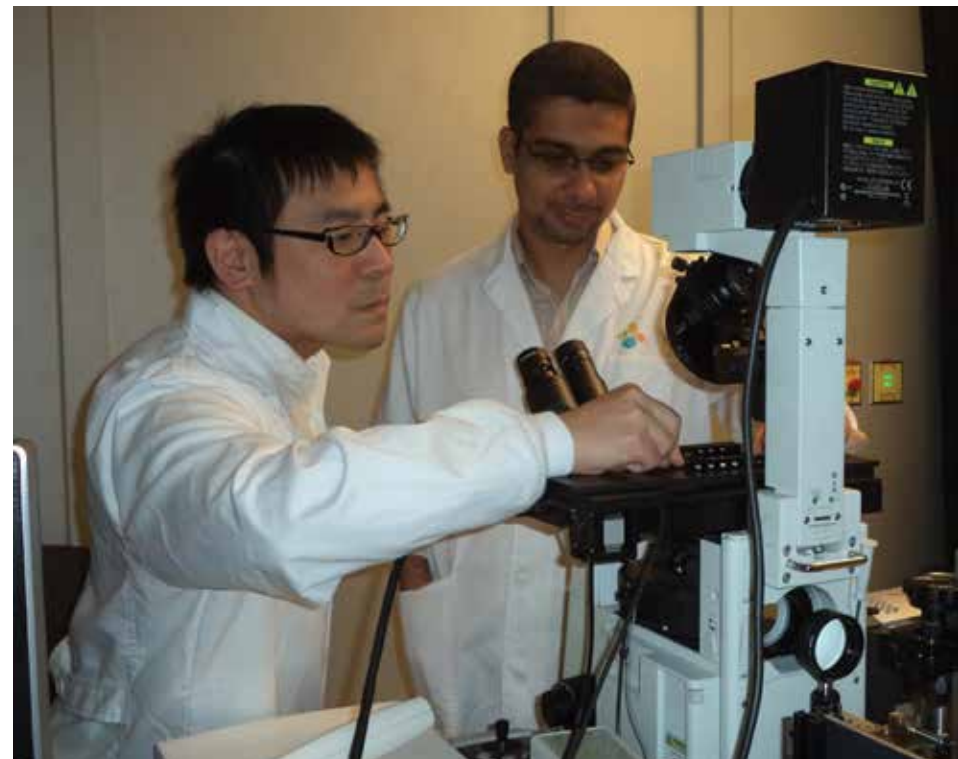
Molecule tracking redefined

SMLT does not provide information about the shape and size of individual molecules or of molecular conformational dynamics, has different limitations in data analysis, can be inefficient and does not always work.

Because of these issues, the team focused on developing a new multi-parametric single-molecule imaging method that "provides a unique opportunity to simultaneously characterize these fundamental physical properties," said Habuchi.

The cumulative-area method

The new method relies on the characterization of cumulative area occupied by the molecules, and is called the cu-



mulative-area (CA) method. The researchers used micrometer-sized DNA molecules as model systems and showed that the CA method worked for a wide range of nano- and micro-sized objects ranging from nanoparticles to macromolecules.

"The CA method gave quantitative information about the size, diffusion coefficient and conformational relaxation time of the individual molecules we examined," Habuchi said. "We believe it will provide a platform for multidisciplinary research, and it expands the capability of molecule imaging techniques to a wider spectrum of research areas."

For example, Habuchi pointed out that the CA method could be used to study polymer dynamics in physics, and could also be employed to examine the molecular mechanism of the spatial organization of chromatin in a cell.



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"The life sciences and materials science field are the research fields where single-molecule imaging techniques can play a major role. In particular, if researchers are examining molecular motion and structural dynamics, our method can serve as a powerful tool," he explained.

Elegant new method

The researchers noted they were surprised that no one had come up with the idea of the CA method before, because "our method is elegant but also very simple," said Serag, first author of the paper. "After obtaining all of the simulated data, we were convinced we'd found something very important."

"The development of new molecular imaging techniques and methods is becoming increasingly important in modern scientific research, as understanding on a molecular level is key for many cutting-edge research areas," noted Habuchi.

"Indeed, new scientific findings and the development of new materials are often based on new molecular imaging techniques. As this area continues to grow in the future, we believe our new imaging method will offer researchers a better way to conduct their research at the molecular level," he added. ●

1. Professor Satoshi Habuchi, postdoctoral fellow Maged Serag and Ph.D. student Maram Abadi used a complex laboratory setup to develop their new single-molecule imaging method. Photo by Caitlin Clark.

2. Prof. Habuchi (L) and Dr. Maged Serag (R) at work in the lab on research for their Nature Communications paper. Photo by Caitlin Clark.

3. World leaders in catalysis research, including professors from KAUST and other international universities, assembled for the Catalytic Carbon and Hydrogen Management research conference in February. Photo by Ginger Lisanti.



3

Catalysis conference fosters collaboration

By Caitlin Clark

The KAUST Catalysis Center (KCC) hosted the Catalytic Carbon and Hydrogen Management conference on the University's campus from February 1-4.

The conference brought experts from around the world to discuss opportunities and advances in catalysis, a field at the forefront of many different scientific domains due to future energy needs and increasing concerns about protecting the Earth's environment.

KCC opened in 2011, and its research work focuses on a multidisciplinary approach to catalysis to achieve "catalysis by design." While concentrating on carbon and hydrogen management, researchers there connect their work to two of KAUST's main research thrusts, energy and the environment.

The conference featured talks and presentations by leaders in the field, including Caltech (U.S.) professor Dr. Robert Grubbs, winner of the 2005 Nobel Prize in Chemistry, Dr. Robert Waymouth from Stanford University (U.S.), Dr. Kazunari Domen from the University of Tokyo (Japan) and Dr. Bruce Gates from the University of California, Davis (U.S.).

"The opportunities for catalysis are vast in terms of carbon and hydrogen management," said event chair KAUST Professor Jean-Marie Basset. "There is an obvious need for very deep scientific approaches in this field with individual and collaborative efforts from homogenous, heterogeneous, photo-initiated, bio- and bio-inspired fundamental and applied systems."

Attendee and speaker Dr. Matthias Beller from Leibniz Institut für Katalyse (Germany) noted the conference "presented excellent scientific results of high-caliber and of significant relevance for the future development of society." He added that, as an external visitor, he was able to make contacts within a number of KAUST research groups. "I believe this will help foster future collaborations," he said.

"The conference was an opportunity for world leaders in each field of catalysis to gather together to address hydrogen production and carbon management," said speaker Kazuhiro Takanabe, KAUST Assistant Professor of Chemical Science. "The symposium was successful not only from the scientific point of view, but also in helping KAUST researchers network all over the world in this important field." ●



Tsunami on demand: the power to harness catastrophic events

By Francesca Serra

Can you imagine how much energy is in a tsunami wave or a tornado? Energy is all around us, but it is mainly contained in a quiet state. There are moments in time, however, when large amounts of energy build up spontaneously and create rare phenomena on a potentially disastrous scale. How these events occur is, in many cases, still a mystery.

To reveal the natural mechanisms behind such high-energy phenomena, Andrea Fratalocchi, Assistant Professor in the Computer, Electrical and Mathematical Science and

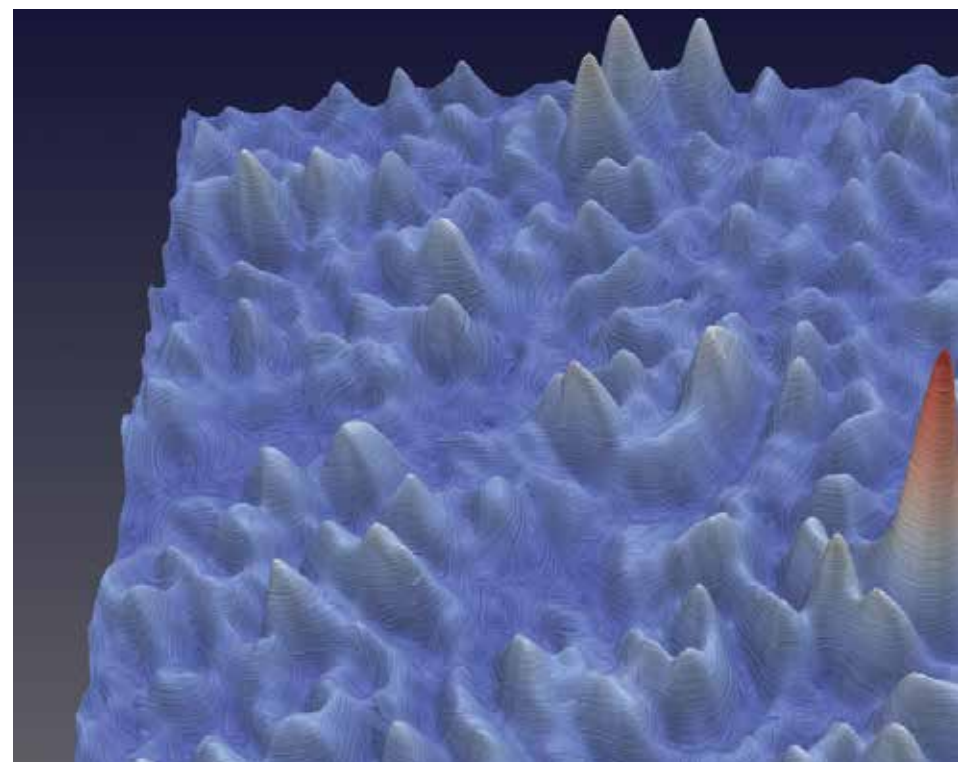
“This discovery can change once and for all the way we look at catastrophic events.”

Engineering division, led a team of researchers from Saudi Arabia and three European universities and research centers in understanding the dynamics of such destructive events. The team also controlled their formation in new optical chips, which can open various technological applications. The results and implications of the study were published in the journal *Nature Physics* (<http://dx.doi.org/10.1038/nphys3263>).

“I have always been fascinated by the unpredictability of nature,” Fratalocchi said. “I believe that understanding this complexity is the next frontier that will open cutting-edge pathways in science and offer novel applications in a variety of areas.”

Fratalocchi’s team began their research by developing new theoretical ideas to explain the formation of rare energetic natural events such as rogue waves, large surface waves that develop spontaneously in deep water and represent a potential risk for vessels and open-ocean oil platforms.

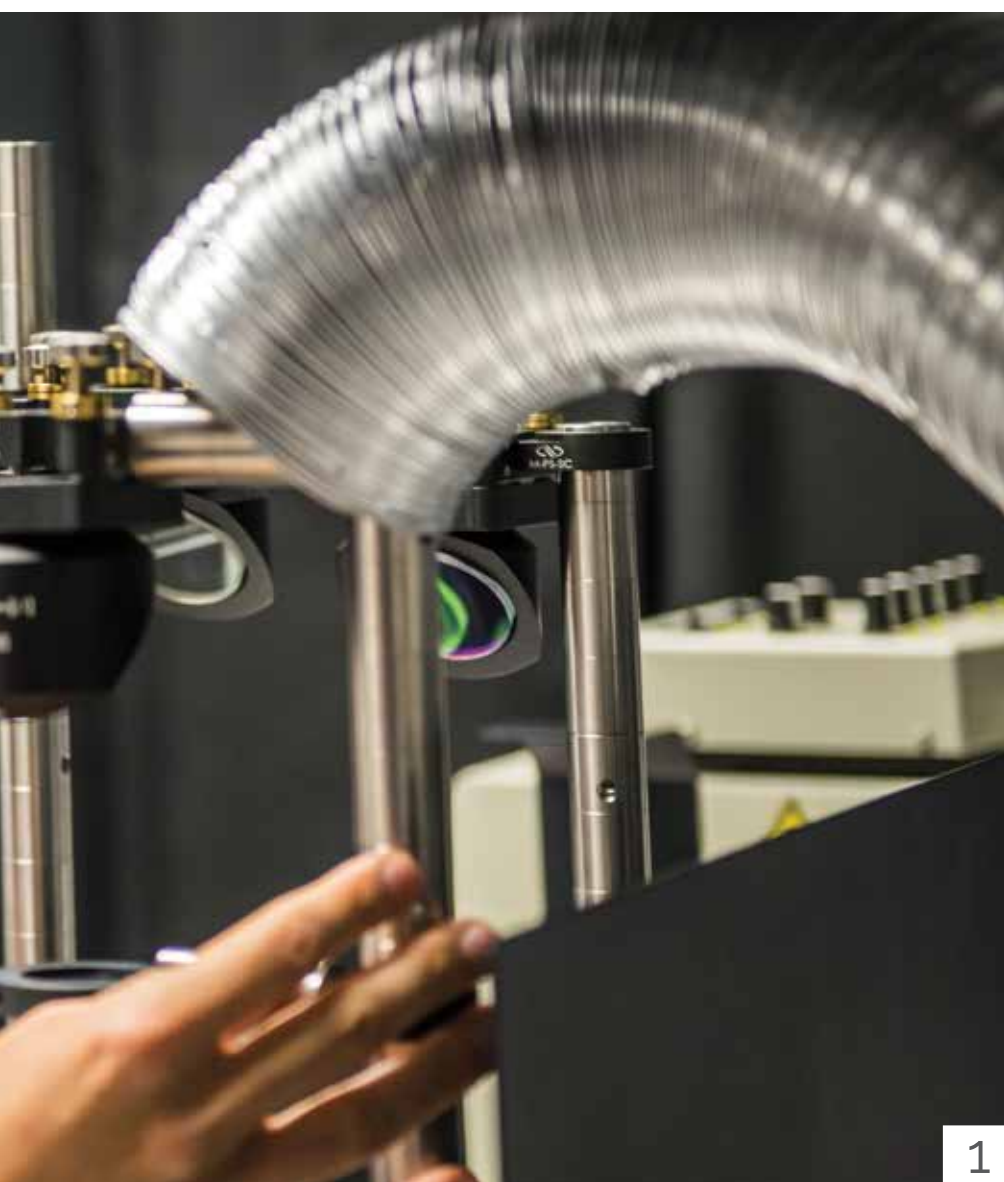
“Our idea was something never tested before,” Fratalocchi continued. “We wanted to demonstrate that small perturbations of a chaotic sea of interacting waves could, contrary to intuition, control the formation of rare events of exceptional amplitude.”



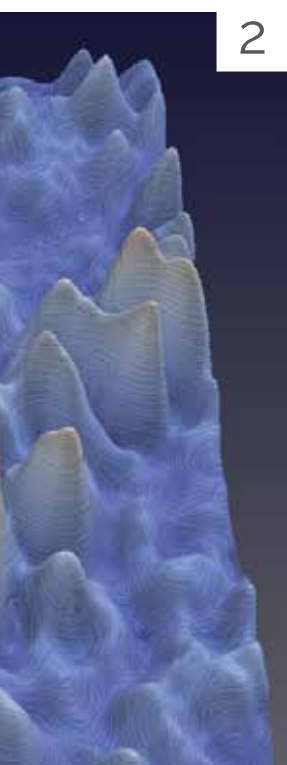
A planar photonic crystal chip fabricated at the University of St. Andrews and tested at the FOM institute AMOLF in the Amsterdam Science Park was used to generate ultrafast (163 fs long) and subwavelength (203 nm wide) nanoscale rogue waves, proving that Fratalocchi’s theory was correct. The newly developed photonic chip offered an exceptional level of controllability over these rare events.

Thomas F. Krauss, head of the Photonics Group and Nano-centre Cleanroom at the University of York, was involved in the development of the experiment and in the analysis of the data.

“By realizing a sea of interacting waves on a photonic chip, we were able study the formation of rare high energy events in a controlled environment,” Krauss explained. “We noted that these events only happened when some sets of waves were missing, which is one of the key insights our study.”



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Kobus Kuipers, head of nanophotonics at FOM institute AMOLF, who was involved in the experimental visualization of the rogue waves, was fascinated by their dynamics. "We have developed a microscope that allows us to visualize optical behavior at the nanoscale. Unlike conventional wave behavior, it was remarkable to see the rogue waves suddenly appear, seemingly out of nowhere, and then disappear again...as if they had never been there," he said.

Andrea Di Falco, leader of the Synthetic Optics group at the University of St. Andrews, said, "The advantage of using light confined in an optical chip is that we can control very carefully how the energy in a chaotic system is dissipated, giving rise to these rare and extreme events. It is as if we were able to produce a determined amount of waves of unusual height in a small lake just by accurately landscaping its coasts and controlling the size and number of its emissaries."

The outcomes of the project offer leading-edge technological applications in energy research, high speed communication and in disaster preparedness.

Fratalocchi and the team believe their research represents a major milestone for KAUST and for the field. "This discovery can change once and for all the way we look at catastrophic events, opening new perspectives in preventing their destructive appearance on large scales, or for using their unique power for ideating new applications at the nanoscale," Fratalocchi concluded. ●

1. Andrea Fratalocchi led a team of researchers from KAUST and European universities and research centers to develop a chip capable of generating nanoscale rogue waves. Photo by Tünde Gáspár.

2. A fully experimental image of a nanoscaled and ultrafast optical rogue wave retrieved by a near-field scanning optical microscope (NSOM). The flow lines visible in the image represent the direction of light energy. Image courtesy of Andrea Fratalocchi.

3. International undergraduate students who presented during the WEP poster competition pose with Marie-Laure Boulot, Manager of Enrichment Programs. Photo courtesy of WEP.



3

Annual WEP international undergraduate poster competition

Each year, KAUST's Winter Enrichment Program (WEP) hosts an international undergraduate poster competition on the University's campus to provide opportunities for students from around the world to showcase their research.

Held on January 20, this year's poster competition attracted entries from 191 students from the U.S., Canada, Europe, Asia and Saudi Arabia. Of the 39 shortlisted finalists, 32 came to the KAUST campus during WEP to present their research work. The competition attracted students from some of the world's top universities, including Caltech (U.S.), MIT (U.S.), Stanford University (U.S.), the National University of Singapore, and the University of Warwick (U.K.).

This year's participating students enjoyed sharing their research with fellow students and the KAUST community and professors, and were evaluated by judges from their respective fields of research.

"The poster competition was a great opportunity to share our research and to learn about what others are researching," said Alonso Garcia, a student from Mexico who won third place in the competition. "I was honored to be part of this amazing experience."

During their weeklong stay at KAUST, finalists met with KAUST faculty, visited the University's state-of-the-art research facilities and labs, attended different WEP events and enjoyed several recreational activities, including snorkeling in the Red Sea.

"My experience at KAUST was nothing short of eye-opening," said competition finalist Qin Xiang Ng from Singapore. "I have found KAUST provides unparalleled opportunities and resources for scientific research and development. It is a global university well-positioned to take on the challenges of the 21st century."

An awards ceremony was held on January 21 to announce the winners of the competition. Awards were presented by Vice President for Academic Affairs James Calvin, Associate Dean of the Biological and Environmental Science and Engineering Division Suzana Nunes and Manager of Enrichment Programs Marie-Laure Boulot.

The 2015 winners and the titles of their posters are:

First Place: Design and fabrication of high-efficiency biomimetic fog harvesting devices; Qin Xiang Ng, National University of Singapore

Second Place: Biotemplated batteries with interconnected conductive networks; Saleem Aldajani, MIT

Third Place: Novel one-pot methodology for the synthesis of α -diaz-othioesters; Alonso Garcia, National Autonomous University of Mexico. ●

Promoting innovation in the Kingdom



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During the 2015 Winter Enrichment Program (WEP), the KAUST Entrepreneurship Center ran several programs to mark the start of an innovation academy-style of modules aimed at promoting innovation culture.

"A key part of economic development in any country is to develop both entrepreneurs and company innovation at all levels of society," said Gordon McConnell, manager of the Entrepreneurship Center. "As a team, we have been listening to KAUST's internal and external stakeholders, and the recent programs show the range of teaching and learning that KAUST is now making available."

ICE in the Desert

Two such programs took place during WEP 2015. The programs were developed in-house and led by experts from the Entrepreneurship Center, with support provided by national and international collaborators.

The first program, Innovation, Creativity and Entrepreneurship (ICE) in the Desert, took participants through an overview of modern business practices. It covered some of the general principles of innovation, creativity and entrepreneurship that are crucial for success in today's business world.

The program also featured two classes on social entrepreneurship and starting community-oriented businesses. These were given by Dr. Sarah Ghaleb, General Manager of Education & Poverty Alleviation Initiatives at Abdul Latif Jameel Community Initiatives

"I was surprised at how many students were interested in starting their own social businesses," Ghaleb said.

The second program, Accelerated Lean Launchpad, tar-

geted faculty and students who had potentially patentable inventions or who were considering starting a new venture or applying for funding.

The REVelate Program

Nurturing innovation within KAUST is not the extent of the University's commitment to the Kingdom's economy. In parallel with the WEP sessions, KAUST delivered the second round of the successful REVelate corporate innovation program.

Run by the Entrepreneurship Center, in conjunction with the Industry Engagement team, the program coached returning members from KAUST's in-Kingdom corporate partners. It also showcased the visible progress of some of the corporate projects started in the first round.

Shafi Al-hsaien, who came from the Saudi Electricity Company's R&D division, attended both rounds of REVelate. He and his team proposed the creation of a professional lab for the testing and maintenance of electricity-generating gas turbines in the Kingdom.

"We got a lot out of the program," Al-hsaien said. "We learned how to present our value proposition, how to define our customers and collaborators, how to sell the potential service and how to calculate cost." ●

1. Participants work together in small groups during one of the learning modules.

2. Hackathon participants work on porting their codes and applications to GPUs to accelerate them. Photo by Caitlin Clark.

3. Master's degree student Zhendong Zhang (third from left), winner of KAUST's first hackathon, holds his NVIDIA K40 GPU, the prize for winning the hackathon. Photo courtesy of Saber Feki.

Workshop and hackathon bring computing talent to campus

By Caitlin Clark

KAUST's Supercomputing Laboratory, in collaboration with NVIDIA, hosted the second KAUST-NVIDIA workshop entitled "Accelerating Scientific Applications Using GPUs" on February 17.

Held in conjunction with the University's first "hackathon" on February 18-19, the workshop provided attendees with a general overview of graphic processing unit (GPU) architecture and high-level programming models while focusing on scientific applications ported to GPUs. Technical sessions included an overview of NVIDIA and its collaborators' efforts in porting scientific and engineering applications to GPUs.

The workshop covered a range of KAUST applications developed on NVIDIA GPUs, including numerical libraries, scientific visualizations, computational chemistry, computational fluid dynamics and seismic imaging and inversion.

A number of speakers from academia, including KAUST Professor David Keyes, KAUST Associate Professor Markus Hadwiger, Dr. Valerio Pascucci, founding director of the Center for Extreme Data Management Analysis and Visualization at the University of Utah, and several KAUST master's and doctoral students, gave guest lectures at the workshop.

Students from other Saudi universities, including King Fahd University of Petroleum and Minerals, Umm Al-Qura University, Effat University and King Abdulaziz University, and representatives from Saudi Aramco and the Saudi Basic Industries Corporation (SABIC) also participated in the workshop.

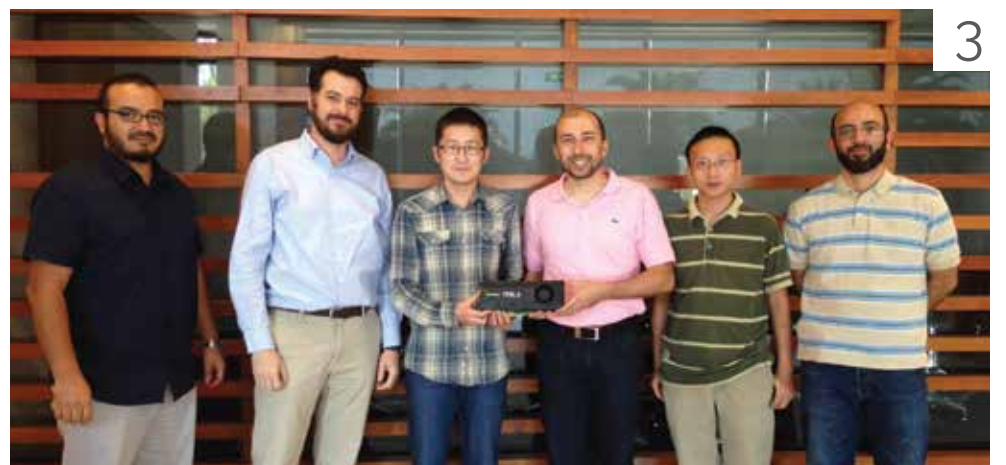
The hackathon was an opportunity for developers to attend a two-day intensive and hands-on workshop guided by OpenACC and CUDA mentors from KAUST and NVIDIA.

Ten participants in four teams attended the hackathon, bringing their scientific applications to port to a GPU accelerator. Teams came from KAUST's Spatio-temporal Statistics and Data Analysis Group (headed by Professor Marc Genton), the Clean Combustion Research Center, the Seismic Wave Analysis Group (headed by Professor Tariq Alkhalifah) and SABIC.

The developers targeted four different domain science applications at the hackathon, including statistics, combustion, seismic imaging and molecular dynamics. KAUST mentors assisting at the event were event co-organizers Drs. Saber



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Feki and Hatem Ltaief, Dr. Bilel Hadri and doctoral students Ali Charara and Ahmad Abdelfattah.

"The four exciting teams brought their codes and their applications to port them to GPUs to accelerate them and have better performance," said Dr. Feki, a computational scientist in KAUST's Supercomputing Laboratory.

"Many people are scared of changing codes or using new hardware," noted fellow computational scientist Dr. Hadri. "The hackathon helped show the teams that we can 'democratize' the use of GPUs – you don't need to be an expert to do this, you just need to use the tools at hand, and we were here to help."

The winning team at the hackathon consisted of master's degree student Zhendong Zhang from the Seismic Wave Analysis Group. As a prize he received an NVIDIA K40 GPU sponsored by NVIDIA.

"With initially no experience at all with GPUs, all four teams were successfully running their applications on GPUs by the end of the hackathon," said Dr. Feki. "The seismic imaging group ported their Reverse Time Migration code to GPUs using OpenACC and achieved a performance speedup of 6X."

Drs. Feki and Ltaief added they were pleased the hackathon fostered interdisciplinary research collaborations between two of KAUST's Research Centers, the Extreme Computing Research Center and the Clean Combustion Research Center. ●



Five-week writing experience **leads to KAUST enrollment**

By David Murphy

James Scott Berdahl originally came to KAUST through a pilot writing program offered in 2014 by the KAUST Communications Department to students and alumni of the MIT Graduate Program in Science Writing. Of the three students interviewed, Berdahl was selected to experience KAUST as part of the Communications Department team covering last year's Winter Enrichment Program (WEP) from January 5 – February 6, 2014.

A year later, Berdahl returned to KAUST, but this time as a Ph.D. student in the Biological and Environmental Science and Engineering Division under the tutelage of Matthew McCabe, Associate Professor of Environmental Science and Engineering.

Like so many before him, he was unsure of what to expect during his first visit to KAUST.

"Before the pilot writing experience, I hadn't heard of KAUST, so it initially was an opportunity to see another part of the world," he said. "I received an email on my alumni email list alerting me to the pilot writing assignment at KAUST. Later, Michelle D'Antoni, who is head of KAUST Public Relations, got in touch with me, and before I knew it, I was at KAUST interviewing many interesting and talented people behind the scenes at WEP 2014."

From his five week stint at KAUST, Berdahl was impressed enough with what he saw that he applied to study here. "I could see this place had a lot of opportunities, so much so I decided to come back. I put in an application, and luckily I got accepted," he said.

The transition from interviewing scientists last year to his current steps to become one of them is not lost on him.

"Being a student again? It's weird – I had about a four-year hiatus from being a student. Getting back into the routine of studying and assignments again was strange, and some of my skills sets had become rusty," he said. "However, it was always in the back of my mind to go back to study. After my master's degree, I launched into work, and then things slowed down a bit. So when the opportunity arose to study at KAUST, I grabbed it."

For a young man, Berdahl has already experienced a vibrant and varied life, including time spent in East Africa prospecting for minerals.

"When I finished my master's degree, I was working as an exploration geologist or a prospector, so I had the op-



portunity to do a lot of exploration work in the Yukon, the area of Canada where I'm from, and also in the U.S. Upon coming here, I also had to the chance to visit and prospect in Ethiopia. I ended up in some pretty remote parts of the country looking for various minerals," he said.

Berdahl is quick to espouse the positives of living and working at KAUST. "With the resources here at KAUST, no dream is too grand. I mean, if your dream is relevant and worthwhile, you are in a place where you can actually achieve it," he noted.

Berdahl is excited about the research he is involved in, from the emerging science of drones to the 3D mapping and scaling of deformations in moving land features.

From speaking to him, you can almost sense his positive enthusiasm and explorer's mentality. When asked what his plans may be for after his KAUST studies, Berdahl unflappably shrugged his shoulders and said, "Well, we'll just see what happens." ●



من كاتب مقالات علمية مؤقتة إلى طالب دكتوراه في جامعة الملك عبدالله

مع هيئة تدريس مرموقة. لذلك قررت زيارتها مرة أخرى. وأنا محظوظ جداً الآن بعد أن التحقت بها.

ولم يخطر ببال الطالب سكوت أنه سيتنقل من إجراء مقابلات مع العلماء وكتابة المقالات في جامعة الملك عبدالله إلى الدراسة فيها من أجل أن يصبح عالماً مثلهم. حيث يصف سكوت أن العودة إلى أجواء الدراسة مرة أخرى كان صعباً بالنسبة له خصوصاً أنه انقطع عن الدراسة بسبب عمله، إلا أنه لم يرغب في تضييع هذه الفرصة الكبيرة لإكمال دراسته العليا في جامعة فريدة كجامعة الملك عبدالله.

وعمل سكوت قبل التحاقه بجامعة الملك عبدالله في مناطق مختلفة من العالم كان آخرها منطقة شرق أفريقيا حيث كان يعمل في مجال التنقيب عن المعادن. ويقول سكوت: "عملت بعد تخرجي من الجامعة كمستكشف جيولوجي وأتاح لي هذا العمل فرصاً كثيرة لاستكشاف مناطق في شمال كندا والولايات المتحدة الأمريكية. كما عملت أيضاً مع والدي في التنقيب عن المعادن في إثيوبيا حيث استكشفنا بعض المناطق النائية جداً هناك".

وينظر طالب الدكتوراه سكوت إلى الدراسة والحياة في الحرم الجامعي بإيجابية كبيرة حيث يقول: "تمتلك جامعة الملك عبدالله موارد كبيرة بحيث يمكن لأي طالب أو عالم تحقيق حلمه بسهولة خصوصاً إذا كان هذا الحلم يتماشى مع أهداف الجامعة ومجالات أبحاثها الاستراتيجية". كما عبر سكوت عن مدى حماسه في العمل والمشاركة في مجموعة من الأبحاث المتميزة في جامعة الملك عبدالله مثل أبحاث الطائرات بدون طيار وتصميم الخرائط ثلاثية الأبعاد وقياس تشوهات القشرة الأرضية وحركتها.

حضر طالب الدكتوراه جيمس سكوت بيردالين إلى جامعة الملك عبدالله للعلوم والتقنية أول مرة بعد أن تقدم إلى قسم العلاقات العامة والإعلام في الجامعة ككاتب مؤقت ضمن برنامج تدريب الكتابة العلمية لطلبة وخريجي الدراسات العليا في معهد ماساتشوستس للتقنية. وتم اختيار سكوت من ضمن ثلاثة طلبة تقدموا للحصول على خبرة العمل ككاتب علمي مؤقت في جامعة الملك عبدالله للفترة من ٥ يناير إلى ٦ فبراير من عام ٢٠١٤. وانضم سكوت إلى فريق العلاقات العامة والإعلام حيث تم تكليفه بكتابة مقالات عن فعاليات وندوات برنامج الإثراء الشتوي لعام ٢٠١٤.

وبعد عام من هذه التجربة الثرية في جامعة الملك عبدالله، عاد سكوت مرة أخرى إلى الجامعة، ولكن هذه المرة ليس ككاتب مقالات علمية وإنما طالب دكتوراه في قسم هندسة وعلوم الأرض وتحت إشراف البروفيسور ماثيو مكابي، أستاذ مشارك في قسم علوم وهندسة البيئة. وتحدث سكوت عن هذه التجربة قائلاً: "لم أسمع عن جامعة الملك عبدالله قبل زيارتي لها أول مرة كمتدرب في الكتابة العلمية. ولم يكن لدي أي تصور عن ما ستكون عليه الجامعة إلا أنني اعتبرتها تجربة مثيرة للتعرف على مكان آخر من العالم. تلقيت رسالة على بريدي الإلكتروني الخاص بالخريجين تضمنت عرضاً لوظيفة مؤقتة في جامعة الملك عبدالله. ثم قامت السيدة ميشيل دانتوني رئيسة العلاقات العامة بالتواصل معي، وبعد ذلك بوقت قصير أصبحت أجري مقابلات مع شخصيات عالمية كبيرة وعلماء وطلبة موهبين وأكتب مقالات عن فعاليات وندوات برنامج الإثراء الشتوي الشيق.

وكانت الاربعة أسابيع التي قضاها في جامعة الملك عبدالله مليئة بالإثراء والمعرفة والمتعة حيث أعجب كثيراً بالجامعة والحرم الجامعي إلى الحد الذي جعله يعقد العزم على مواصلة دراسته العليا فيها، يقول سكوت: "أعجبت بالجامعة منذ الوهلة الأولى حيث وجدت لها مكاناً متطوراً وإمكانيات ومرافق ومختبرات عالمية متميزة

1. James Scott Berdahl is a Ph.D. student in the Earth Science and Engineering Division. Photo by Joël Ruch.

My University



Sondus Khoja

Sondus Khoja, a teacher development program (TDP) intern at The KAUST Schools (TKS), is quick to espouse how KAUST is helping her fulfill her personal and professional dreams.

"The environment here is ideal for both me and my family, and KAUST is a place where my child can receive the best standard of education in a safe and multi-cultural community. At TKS, I am also benefiting from a work environment of ongoing professional and practical training," she says. "Through my TDP training program, I will be able to teach in International Baccalaureate schools and participate in leadership activities."

Outside of the classroom, Sondus lists drawing, graphic design, painting, photography, reading, self-improvement, sewing and traveling as her passions.

She is clear in what she believes KAUST will help her achieve. "For me, being a teacher means I am a lifelong learner. I want to share my experiences and knowledge to help my students become the best they can be and truly become international-minded citizens," she says. ●



Carmen Leticia Castrejon Barron

Carmen Leticia Castrejon Barron graduated from the Instituto Tecnológico de Ciudad Jiménez, Chihuahua, Mexico, in 2009 with a B.S. degree in electromechanical engineering. After an internship with the Comisión Federal de Electricidad (CFE), the main electrical company in Mexico, she returned to Jiménez to teach math, earning her master's degree in education while teaching.

Carmen's true calling – electrical engineering – never left her during this time, and after receiving her master's in 2013, she applied to KAUST for a Ph.D. in electrical engineering with Professor Khaled Salama and arrived for the fall semester of 2014.

"The projects in my field are extremely innovating, and the academic staff and facilities here are second to none," Carmen says. "Since coming to KAUST, I have learned so much, and I feel it is continual learning that never ends."

At KAUST, Carmen and her husband are discovering not only Saudi hospitality and culture, but also the many other cultures of the community. "Life here is completely different from what I imagined before moving, and my husband and I are very happy here," she says. "KAUST has a very promising future as an institution for the Kingdom and the region." ●



KAUST diversity shines at 2015 Parade of Nations

By Mohamed Ghoneim

At the annual Parade of Nations event held on March 5 this year, KAUST celebrated the uniqueness of its diverse and multicultural environment and community found between the sand dunes of the Empty Quarter and the deep blue waters of the Red Sea.

Community members representing 75 nationalities on campus met at Discovery Square to raise different countries' flags in a colorful march to the Harbor Sports Club field. The community's diversity was evident not only through the number of flags present, but also in the different age groups, traditional dress and large groups of families and friends present. Young children in vibrant traditional attire added an extra sense of joy to the event with their lively smiles, cheerfulness and national pride.

At the Sports Club field, country booths welcomed the crowd with national items on display representing countries' signature cuisines, landmarks and attractions. The crowd tasted exotic national dishes, including Indonesian coconut-rich food and juice, Finland's salty licorice, Egyptian koshary, rice cakes from the Philippines, Korean spicy vegetables and Taiwanese delicacies.

The large paper model of London's Big Ben at the United Kingdom booth, the handcrafted decorations at the Philippines booth, the colorful ornamental hat at the Mexican table and the hand-made leather slippers at the Mongolian booth stood out. The Pakistani booth displayed handmade ornaments, utensils and decorations. At the Montenegro booth, images of the beautiful Montenegrin coast captured the attention of many. The Indian booth was so popular you could hardly reach it to have a look!

The event concluded after the sun set, following international musical and cultural performances organized by The KAUST Schools. In a community of over 100 nationalities, the annual celebration is an extraordinary showcase of KAUST's distinctive international community living in harmony. ●



Photos by Meres Weche.